



A.D. 1871, 24th MARCH. N^o 804.

S P E C I F I C A T I O N

OF

RICHARD DOVER.

TREATING SEWAGE.

LONDON:

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1871.



A.D. 1871, 24th MARCH. N° 804.

Treating Sewage.

LETTERS PATENT to Richard Dover, of No. 5, St. Stephen's Road, New Road, Hammersmith, in the County of Middlesex, for the Invention of "A MODE AND MEANS FOR PREVENTING THE FLOW OR PASSAGE OF SEWAGE INTO RIVERS OR STREAMS FROM THE SEWERS, DRAINS, AND OTHER CHANNELS, AND RETAINING THE SEWAGE MATTERS FOR AGRICULTURAL PURPOSES."

Sealed the 23rd June 1871, and dated the 24th March 1871.

PROVISIONAL SPECIFICATION left by the said Richard Dover at the Office of the Commissioners of Patents, with his Petition, on the 24th March 1871.

I, RICHARD DOVER, of No. 5, St. Stephen's Road, New Road, 5 Hammersmith, in the County of Middlesex, do hereby declare the nature of the said Invention for "A MODE AND MEANS FOR PREVENTING THE FLOW OR PASSAGE OF SEWAGE INTO RIVERS OR STREAMS FROM THE SEWERS, DRAINS, AND OTHER CHANNELS, AND RETAINING THE SEWAGE MATTERS FOR AGRICULTURAL PURPOSES," to be as follows:—

10 That by its mechanical action the flow or passage of sewage from the sewers of populous places into rivers or streams can be readily and

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permanently intercepted or converged into expressly contrived reservoirs and apparatus or works, and its putrefaction or decomposition arrested summarily and inoffensively therein by such chemical admixtures as salubriously fix or concentrate its ammoniacal and nitrogenous components. 5

The apparatus to be used efficiently to realise my said Invention consists of the requisite number of especially contrived reservoirs and filters, according to the quantity of sewage. Each reservoir will fill in consecutive order, and within a limited time empty itself by gravitation, in the like order. By this contrivance 24 reservoirs each of 10 500 gallons capacity, severally filling and emptying within 1 hour will purify, and the filters in simultaneous action filter off clean and salubrious the aqueous portion of 288,000 gallons of sewage each day of 24 hours. The sewage matters & admixtures being all retained in a portable, inodorous, and innocuous condition for agricultural purposes. 15 The chemicals employed are the antiseptic and fertilising acids and salts which arrest and fix the putrescent powers of sewage, viz., muriatic or hydrochloric or any other alike efficacious acid. The salts are chloride of sodium, or calcium, or magnesium, or any other may be used, and protosulphate of iron, or the sulphate of the peroxide of iron; 20 and when necessary to fix more effectually the putrescent qualities of the sewage to these salts may be added portions of protochloride or muriate of iron, or oxide of iron to any muriatic acid. The quantities of these chemicals for each ton of liquid sewage vary as much as 100 p. cent. according to its more or less foul condition, and can 25 be determined only by analysis or practise, consequently the acids vary from three to six pounds, the protochloride or muriate of iron varies from half to one pound, and the metallic salts also vary from two to six ounces.

SPECIFICATION in pursuance of the conditions of the Letters Patent, 30
filed by the said Richard Dover in the Great Seal Patent Office
on the 14th August 1871.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD DOVER, of No. 5, St. Stephen's Road, New Road, Hammersmith, in the County of Middlesex, send greeting. 35

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WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-fourth day of March, in the year of our Lord One thousand eight hundred and seventy-one, in the thirty-fifth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Richard Dover, Her special licence that I, the said Richard Dover, my executors, administrators, and assigns, or such others as I, the said Richard Dover, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term
10 therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for “A MODE AND MEANS FOR PREVENTING THE FLOW OR PASSAGE OF SEWAGE INTO RIVERS OR STREAMS FROM THE SEWERS, DRAINS, AND OTHER CHANNELS, AND RETAINING THE SEWAGE
15 MATTERS FOR AGRICULTURAL PURPOSES,” upon the condition (amongst others) that I, the said Richard Dover, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and
20 cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Richard Dover, do hereby declare the nature of my said Invention, and in what manner the same is to
25 be performed, to be particularly described and ascertained in and by the following statement in writing and by the portion of it contained in the accompanying plan illustrating the contrivances for carrying out those details of my said Invention and conjointly forming this my Specification.

30 The nature of my said Invention is a mode and means for the ready and permanent interception and convergence of the sewage in its flow or passage towards rivers or streams from the sewers and other channels of populous places into expressly contrived works and apparatus; and for arresting therein summarily and inoffensively its putrefaction or
35 further decomposition by such chemical admixtures as salubriously fix or concentrate its ammoniacal and nitrogenous components.

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And the manner in which the same is to be performed is by such combined mechanical and chemical action as will realise effectually my said Invention, and enable the diurnal sewage of such populous places to be both expeditiously and continuously purified.

The works and apparatus are contrived for the uninterrupted reception 5 and treatment of the diurnal sewage ~~estim~~-estimated to flow through or be discharged by or from the sewers, drains, pipes, channels, cuts, docks, canals, watercourses, &c^a. of populous places, in order to all the feculent or putrescent and other ammoniacal or nitrogenous matters therein being effectually and permanently arrested and retained in a portable, inodorous, 10 and innocuous but valuable condition for agricultural purposes, its aqueous portion rendered salubriously useful and valuable, also for such public purposes as street watering [because it counteracts dust], flushing stagnant sewers, and washing down urinals, and the residuum retained without either olfactory or visual offence. This mode and means for 15 preventing the flow or passage of sewage into rivers or streams from the sewers, drains, and other channels, and retaining the sewage matters for agricultural purposes consists in converging it into an appropriately constructed and provided tank [or tanks] of circular form with concave floor and agitators, for the reception and detention of the sewage of 20 Sundays, separation of all extraneous bodies or matters, equalisation of its condition, and disintegration of the fecal portions, to enable the chemical agents to act upon them more readily. From the converging tank [or tanks] the sewage flows into a pumping well, and from it is raised, upon the most improved hydraulic principles, without any 25 offensive emanation into the deodorizing reservoirs.

For the deodorization of the diurnal sewage of a town discharging fifty to sixty tons per hour on the average, the works [as per plan annexed] consist of twenty-four deodorizing reservoirs, numbered 1 to 24, each to hold about 500 gallons of sewage [or if more convenient for 30 the locality a fewer number of 1,000 gallons each] and capable of receiving, deodorizing, and filtering off uninterruptedly the aqueous portion of the diurnal sewage of 20,000 to 25,000 persons. Each of the 24 deodorizing reservoirs is to fill and empty in an hour, i.e., 24 times in 24 hours multiplied by 500 give 288,000 gallons of sewage disposed 35 of, with great sanitary benefit, as well as public utility, each day of 24 hours. I have contrived them of cast iron, of cubical form, with angular

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bottoms, on account of their being most rapid in action, largely self-acting, least costly, most compact, easily kept clean, and the facility with which they can be placed at, over, or conveniently adjacent to any sewer, drain, or other channel. The distribution of the sewage into the
5 said reservoirs may be in various ways, in some localities it can be effected most conveniently through an intervening tank with conduits. The reservoirs will fill consecutively, and whilst the sewage is flowing into them the chemical agents are added, and both commingle thoroughly by the continued pouring in of the sewage. So soon as a reservoir is full
10 a tap or valve in a siphon conduit admits the deodorized aqueous portion of the sewage through an interceptor into a 1st filter charged with animal or vegetable charcoal, peat, or such other filtering media as will separate the deodorized aqueous portion of the sewage from the matters in a purified condition, and neutralize and arrest whatever putrescence
15 may be therein in solution or suspension. The filtering materials [in the filters] are guarded and covered by perforated plates and strainers, through which the aqueous portion [of the sewage] filters itself, on the ascending principle, freed from the sewage matters and perfectly wholesome. The conduit from each reservoir to each 1st filter, upon the
20 siphon principle, enables a greater quantity of the effluent water to discharge itself than it could if not so contrived. The mouth of each siphon conduit has a guard to prevent clogging. From the 1st filter the purified water gravitates into a 2nd filter, constructed on either ascending or descending principles, as most convenient [and similarly
25 guarded and covered], its filtering media, sand, gravel, marl, clay, or earth, with the requisite quantity of lime or lime water; the only purpose of this 2nd filter being the further purification of the effluent water which flows from it limpid and fit for discharge into any river or stream. In the event of any conservancy board or other river
30 authority requiring the effluent water to be aerated, it can very easily gravitate from the 2nd filter into a 3rd, or even more filters, and also over or down an intervening cascade. The reservoirs having emptied themselves consecutively of the effluent water the residuum of each gravitates consecutively also through its exit into an under filter in a
35 very few minutes in a semi-fluid state void of offensive smell. The filters are of cast iron, oblong in form, and contrived also upon mechanical principles to guard against their action being either delayed or impeded, as well as derangements of their filtering media. The under filters into

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which the residuum descends by gravitation also may be of wood on account of their being of necessity moveable; their filtering media, animal or vegetable charcoal, peat, or such other materials as will fix and retain every valuable component, but neither lime in any form, nor other like caustic materials are to be used in them. The strainers in 5 all the filters are of metal or wood, with cocoa-nut matting, and in the interceptors of metal with sponge.

In the Drawing hereunto annexed Figure 1 is “plan [superficial] of works for receiving, deodorizing, and filtering fifty to sixty tons of sewage per hour;” and Figure 2 is “front elevation of 1st row of 10 reservoirs 1 to 6, 1st and 2nd filters, conduits, interceptors, &cⁿ. and under filters.”

A are taps, which may be either handle, lever, or self-acting; B are interceptors with vents; C and D are conduits; = = = = = strainers; E, exits for effluent waters. 15

At the centre of each angular bottom there is an exit for the residuum covered by a male screw. All the filters have taps or valves to free them from stagnant water, and there are all the required drains in the works for the effluent waters.”

To arrest the putrefaction and further decomposition of the sewage I 20 employ the chemical agents which deodorize, disinfect, and concentrate or fix its feculent, putrescent, and other organic components, and increase their fertilising powers, viz., muriatic or hydrochloric or any like efficacious acids with oxide of iron and protosulphate of iron, or the sulphate of the peroxide of iron in combination with chloride of magnesium or 25 calcium, or potassium, or sodium, or any other of the like salts, and whenever necessary to concentrate and fix the casually intense putrescent qualities of the sewage the quantities of the chemical agents have to be proportionately increased or varied.

It is necessary to be clearly understood that the condition of the 30 sewage does vary very much from atmospheric influences, and so very frequently also in its composition from other causes, that the quantities of the chemical agents for each ton of liquid sewage have to be varied as much as a hundred per cent., according to its more or less foul condition, which can be determined by practise or analysis only, conse- 35 quently the quantities of acids will vary from three to six or more pounds, the oxide of iron will vary from about half to one pound, the

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protosulphate of iron and metallic salts will vary from two to six or more ounces. These chemical agents are compounded in the usual manner and do not require more than ordinary care, prudence, or labour in their preparation and application to develope in combination with
5 sewage their inherent antiseptic, prophylactic, and valuable fertilising qualities.

Sewage in the ordinary condition, and containing the average quantities of feculent and other ordinary discharges from the habitations of a populous place, but uncontaminated with such extraneous refuse as
10 those of dyeworks, paper mills, or other like noxious, valueless, and detrimental elements can be deodorized, its matters concentrated, and the aqueous portion filtered therefrom clean and wholesome, by the admixture of about three pounds of muriatic, or hydrochloric, or any other like efficacious acids, about four ounces oxide of iron, about three
15 ounces protosulphate of iron, and about three ounces of chloride of magnesium, or the other chlorides diluted in about six pounds of water for a ton of such "average sewage." Quite ninety-five parts in each hundred of the sewage after treatment according to my Invention gravitate away clean and wholesome water, and leave the residuum
20 inodorous and innocuous, but very valuable in its fertilising qualities. This residuum dries readily without artificial heat, and if kept dry in any airy floor, loft, or warehouse, its valuable fertilising properties are not deteriorated by either time or atmospheric action. It is very valuable also as the basis of a manure for cereal cultivation, and when
25 compounded with the organic, ammonical, and nitrogenous refuse abounding in all populous places is doubly valuable to agriculturists on account of its concentrated condition rendering it available at all seasons and for every locality or soil; added to all which it is entirely free from any of the germs of the parasitical weeds which are inherent in all
30 farmyard and stable manures.

The rapid and complete separation of the aqueous portion of the deodorized sewage from the matters is an all important part of the disposal of the diurnal discharges from every populous place; of necessity, therefore, the action of the filters must be equal to the purification of
35 those diurnal quantities.

The filtering capability of the water companies downward system is, in the 12th Report of the Privy Council on the public health, under

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thirty gallons per square yard per hour, consequently that system is not adequate to the sewage requirements.

My contrivances for filtering off the aqueous portion of the diurnal sewage is by ascent, with such guards [to prevent clogging] as every intelligent practical man will understand, see the use of, and therefore 5 provide, together with all the necessary conduits, taps or valves, vents, and other permanent adjuncts.

The Patent Act, Vict^a. 15–16, chap. 83, prescribes that the petitioner shall state in his petition to Her Majesty for a Patent, that “he believes his Invention will be of great public utility;” in testimony of that 10 required expression of belief I declare that even beyond the public benefits herein-before stated, this my said Invention will enable all the orders and enactments under the several Acts of Parliament [Vict. 29–30, chaps. 89 and 90; Vict^a. 30, chap. 101; Vict^a. 30–31, chap. 113; Vict^a. 33–34, chap. , 1870], to be fully and readily carried out alike 15 in spirit as in the letter; will also enable the immediate and beneficial realization of the publicly important suggestions of Lt.-Col. Ewart, R.E. to the Home Office, on the “separate system or proper principles of drainage in the towns of Oxford, Eton, Windsor, and Abingdon;” will annihilate the causes of the sewage gases which poison the atmosphere 20 in so many streets in populous places and generate cholera and the other alike infectious epidemics; will relieve all the towns from the impending onerous pollution penalties; supercede all rates levied for sewage purposes; and enable municipal authorities to acquire very large annual revenues from the rational utilisation of their sewage [it being well 25 known that “sewage contains the elements of the most valuable manure in the world,” and is worth intrinsically ten or more shillings per head per annum of the population], instead of, as now, poisoning the water used by so many millions of people for culinary and all other domestic purposes; and will enable every populous place to give any desirable 30 declivity to all their sewage drains, however level their localities may be.

Having thus disclosed the nature of my Invention, and explained the manner or best mode and means known to me for carrying the same into the most beneficial effect, I conclude by declaring that I claim this 35 “mode and means for preventing the flow or passage of sewage into rivers or streams from the sewers, drains, and other channels, and

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retaining the sewage matters for agricultural purposes," or any mere modifications of the same.

5 In witness whereof, I, the said Richard Dover, have hereunto set my hand and seal, this Fourteenth day of August, in the year of our Lord One thousand eight hundred and seventy-one.

RICHARD DOVER. (L.S.)

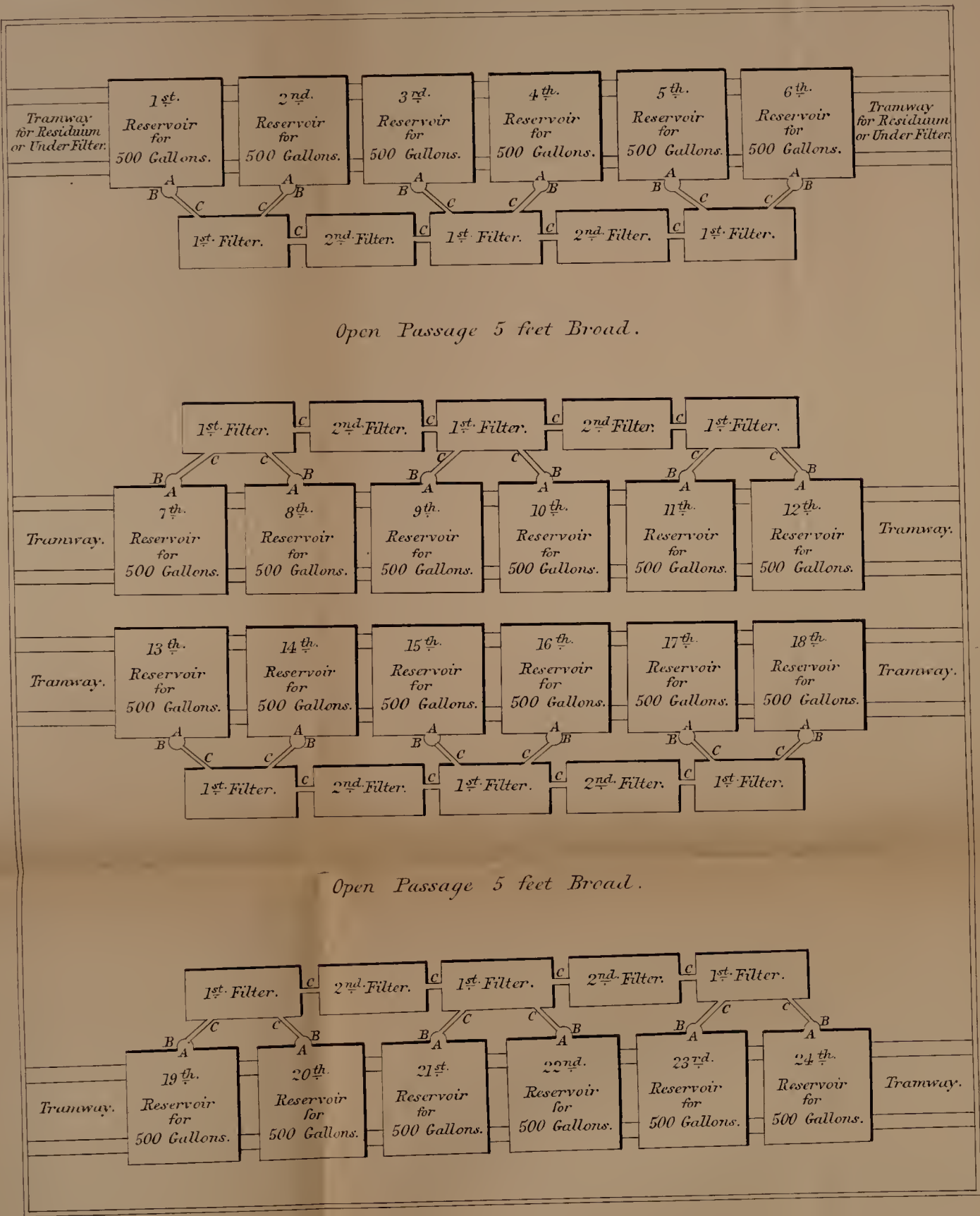
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A.D.1871. MARCH 24. N^o 804.
DOVER'S SPECIFICATION.

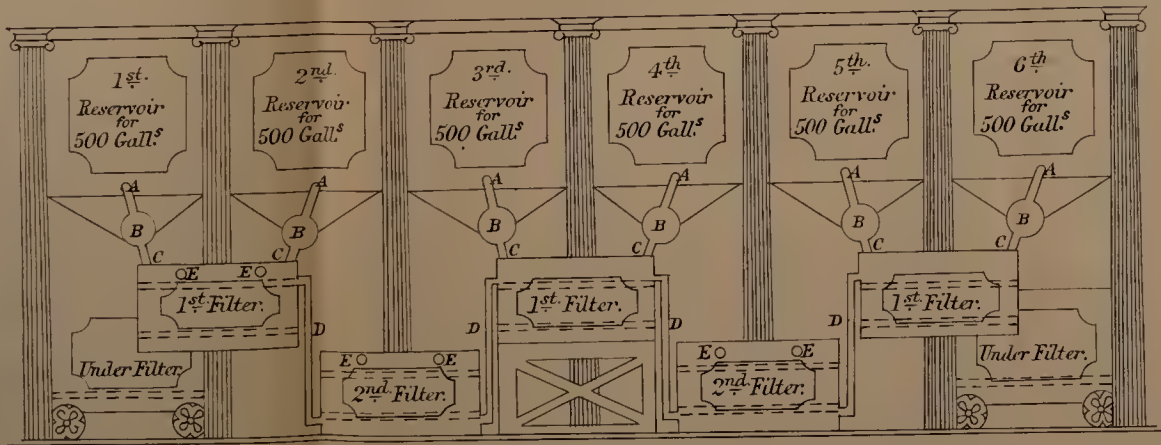
Plan (Superficial) of Works for receiving, deodorizing and filtering Fifty to Sixty Tons of Sewage per hour.

FIGURE 1.



Front Elevation of 1st Row of Reservoirs 1 to 6, 1st and 2nd Filters, Interceptors, Conduits, &c. and under Filters.

FIGURE 2.



A are Taps which may be either handle, lever, or self-acting. — B are Interceptors with Vents. — C and D are Conduits. — ===== are Strainers. — E exits for Effluent waters. — At the centre of each angular bottom there is an exit for the Residuum covered by a male screw. All the Filters have Taps or Valves to free them from stagnant water, and there are all the required Drains in the Works for the effluent waters.

